

## REMARKS

Claims 1 – 57 are pending in the application. Claims 1, 19, 21-22 and 51 are hereby amended. New claims 58-60 are hereby added.

### *Claim Objections*

Claims 21 and 22 were objected to on grounds of informalities. More specifically, the claims were rejected because of the use of the word "prestored".

Claims 19, 21 and 22 are amended to replace "prestored" with "reference" so as to overcome the objection.

### *Claim Rejections – 35 USC 112*

Claims 21 and 22 were objected on grounds of insufficient antecedent basis.

Amended claims 21 and 22 replace "prestored" with "reference", thereby providing proper antecedent basis.

Favorable reconsideration in view of the above amendments is respectfully requested.

### *Claim Rejections – 35 USC 101*

In this section of the official action, the Examiner rejected claims 1-14, 19-40 and 44-47 under 35 USC 101, as directed to non-statutory subject matter.

Statistical process control (SPC) techniques utilize statistical tools to monitor the progress of a process, in order to identify significant deviations from the expected statistical model. SPC applies to a wide variety of fields, including industrial processes, data mining, medical data analysis, and more.

Once deviations from the expected model are identified, these deviations may be analyzed in order to control the process, to identify anomalous inputs to the process, to generate alerts, and to improve the understanding of the process. For example, the state of a physical buffer in a production line may be observed by monitoring the number of parts that are stored in the buffer, so that an alert may be issued when changes in the manufacturing process are detected.

A second example is a data mining application in which a sequence of records in a database is analyzed, and a decision is made whether the sequence has similar statistical properties to reference records, such as the records previously stored in the database. The analysis detects changes in the characteristics of the source which

generates the records in the database. Thus a bank may analyze customer account activities in order to determine changes in a customer's financial stability.

Claims 1 and 19 are hereby amended so as to teach an apparatus which operates upon a data sequence that describes the ongoing status of a monitored process. Claim 51 is amended so as to define a computer implementing a method which operates upon such a data sequence. A departure from the expected statistical model is indicative of a possible problem occurring within the monitored real-world process.

Claim 1 is hereby amended to claim:

1. Apparatus embodied in a computer for building a stochastic model of a data sequence, said data sequence comprising time related symbols selected from a finite symbol set, the apparatus comprising:

an input for receiving said data sequence, *wherein said data sequence describes ongoing states of an observed process,*

a tree builder, for expressing said symbols as a series of counters within nodes, each node having a counter for each symbol, each node having a position within said tree, said position expressing a symbol sequence and each counter indicating a number of its corresponding symbol which follows a symbol sequence of its respective node;

a tree reducer, for reducing said tree to an irreducible set of conditional probabilities of relationships between symbols in said input data sequence, and

a comparator for comparing said reduced tree with a reference tree obtained in advance of said receiving sequential data so as to determine whether there has been a statistical change between said two trees and for outputting an analysis of said monitored process in accordance with said comparing.

Claim 1 now clearly states that the input data sequence relates to a process which is being observed. In this way measurements of physical objects (i.e. devices on a production line) or activities (i.e. customer bank transactions) are transformed outside of the computer into computer data.

Support is found inter alia in para. 103 the instant specification which states:

The second context tree is a monitored tree, generated periodically from *a sample of sequenced observations, which represents the behavior of the process at that period.*

Independent claims 1, 19 and 51 additionally include the feature of outputting the results of the comparison in order to provide information about the behavior of the observed process. Support is found *inter alia* in para. 103 of the instant specification which states that the comparison between the two trees "indicates whether there has been any significant change in the process that requires intervention".

The present invention is clearly concrete as it forms a technique for statistical process control. The present invention operates on data that is collected about a real, monitored process, and outputs a statistical analysis of the process. Such an output is useful as it provides information about whether there has been a statistical change in the collected data or not. As stated in para. 252 of the instant specification:

The comparison stage as described above allows for changes in the statistics of the symbol relationships to be monitored and thus modeling plus comparison may be applicable to any such process in which dynamic changes in those statistics are meaningful.

Such information allows, *inter alia*, medical diagnostic applications, data mining, and industrial process control. The present invention provides a tangible result as it provides the information required for monitoring and control of the observed process.

The Applicant therefore maintains that the claims as hereby amended provide a concrete, useful and tangible result, thus constituting statutory subject matter. See State Street Bank & Trust Co. v. Signature Financial Group Inc., 149 F. 3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 50 USPQ2d 1447 (Fed. Cir. 1999).

Furthermore, amended claims 1, 19, and 51 teach the manipulation of data representing physical objects or activities, thus falling within a safe harbor of statutory subject matter. Specifically, the presently amended claims teach the measurements of observed real-world objects or activities (i.e. the monitored process) to be transformed outside of the apparatus (or computer) into analyzable data, where the data comprises signals corresponding to the objects or activities external to the computer system, and

where the invention causes a physical transformation of the signals which are intangible representations of the observed objects or activities, see *Schrader*, 22 F.3d at 294, 30 USPQ2d at 1459 citing with approval *Arrhythmia*, 958 F.2d at 1058-59, 22 USPQ2d at 1037-38; *Abele*, 684 F.2d at 909, 214 USPQ at 688; *In re Taner*, 681 F.2d 787, 790, 214 USPQ 678, 681 (CCPA 1982).

Numerous examples of applications of the present invention are described in paras. 252-265 of the instant specification. Amongst the examples listed is a medical application which provides an alert when a change occurs in a patient's condition (para. 258), providing control information of a real-world manufacturing processes by observing buffer levels in the production line (para. 254), and a forecasting application in which a weather forecast is provided after an analysis of collected natural data (para. 261).

Furthermore, the Examiner accepts that dependent claims 15-18 and 41-43 fulfill the requirements for statutory subject matter. These claims respectively teach an apparatus which operates upon: seismological data, the output of a medical sensor, or data indicative of cyclic operating machinery. The Applicant maintains that each of these data sequences constitutes a data sequence that consists of observations of a monitored process, as provided for in amended independent claims 1, 19 and 51.

The Applicant therefore believes claims 1-14, 19-40 and 44-47 are directed to statutory subject matter.

Favorable reconsideration of this rejection in view of the above amendments is respectfully requested.

#### ***Claim Rejections – 35 USC 102***

Claims 1-24 and 30-57 are rejected under 35 USC 102 as being unpatentable over Ben-Gal et al. *An Information Theoretic Approach for Adaptive Monitoring of Processes*, presented at ASI2000, The Annual Conf. of ICIMS-NOE and IIMB. 2000 (hereinafter "**Ben-Gal**"). The Examiner states that the cited reference has a different inventive entity than the instant application.

Included is a declaration stating that co-inventor, Gonen Zinger, was a contributor to the research described in the above article, and that his name was omitted from the list of authors due only to the fact that he did not actively participate in writing the cited **Ben-Gal** reference.

In consequence, the inventors of the present patent application and the authors of the cited reference form a single inventive entity. The publication date of the **Ben-Gal** reference is September 18, 2000, which falls within the one year grace period.

The Applicants therefore assert that the **Ben-Gal** reference does not serve as a basis for rejection under 35 USC 102.

Favorable reconsideration of this rejection in view of the enclosed declaration is respectfully requested.

#### ***Claim Rejections – 35 USC 103***

Claim 25 was rejected under 35 USC 103(a) as being unpatentable over **Ben-Gal** in view of Naranjo et al. "Resampling Software for Analysis and Validation of Enumerative and Binomial Sampling Plans." Undated. Printed Dec. 9, 2005.  
<http://www.wcrf.ars.usda.gov/software/rvspman.html>.

Claims 26-29 were rejected under 35 USC 103(a) as being unpatentable over **Ben-Gal** in view of Weinberger et al. "A Universal Finite Memory Source", IEEE Transactions on Information Theory, May 1995, Vol. 41.

In light of the enclosed declaration, and as discussed above, the Applicants assert that the **Ben-Gal** reference does not serve as a basis for rejection under 35 USC 103.

Favorable reconsideration of this rejection in view of the enclosed declaration is respectfully requested.

#### **New claims:**

New claims 58-60 are hereby added. Claims 58-60 teach that the input data sequence is obtained by measuring tangible objects.

Claim 58 states:

58. Apparatus according to claim 1, further comprising an observation unit configured for generating said data sequence from measurements of one or more tangible objects.

Claims 59 and 60 include the same limitation, dependent upon claims 19 and 51 respectively.

Support for claims 58-60 is found inter alia in the "Applications" of the instant specification which discusses the application of the present invention to analyzing production line buffers, DNA sequences, and the outputs of medical devices.

It is thus respectfully believed that claims 1-60 are both novel and inventive over the prior art.

All of the matters raised by the Examiner have been dealt with and are believed to have been overcome.

In view of the foregoing, it is respectfully submitted that all the claims now pending in the application are allowable over the cited reference. An early Notice of Allowance is therefore respectfully requested.

Respectfully submitted,



Martin D. Moynihan  
Registration No. 40,338

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**Encl:**

Petition for Extension of Time (3 months)  
Request for Continued Examination (RCE)  
Declaration by Irad BEN-GAL, et al